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ABSTRACT

This study compared college seniors' self-evaluation of skills considered important for lifelong learning from the mid-1980s to the mid-1990s. The study used data from the College Student Experiences Questionnaire (CSEQ), a national database begun in 1983 which includes over 200,000 student records from over 600 colleges and universities. An index derived from the CSEQ, the Capacity for Life-Long Learning, was applied to the records of 26,629 college seniors from 173 colleges and universities who completed the CSEQ in 1984-87 and 16,794 seniors who completed the CSEQ in 1994-97. Findings led to three conclusions: (1) the capacity for life-long learning of seniors in the 1990s approximated that of their 1980s counterparts; (2) students at selective liberal arts colleges exhibited the greatest capacity for life-long learning during both time periods, especially when compared with students at general liberal arts colleges and comprehensive colleges and universities; and (3) students majoring in basic academic disciplines fared better than others (especially business and computer science majors) in developing life-long learning skills and competencies. (Contains 34 references.) (DB)

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The Capacity for Life-Long Learning of College Seniors in the Mid-1980s to the Mid-1990s

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held in Miami, Florida, November 5-8, 1998. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Abstract

The Capacity for Life-Long Learning of College Seniors in the Mid-1980s and the Mid-1990s

This study examines whether seniors are acquiring the continuous, life-long learning skills needed to survive and thrive in a dynamic, information-rich post-college environment. The proportions of seniors reporting substantial progress in skills, knowledge, and competencies considered important for life-long learning remained fairly stable from the mid-1980s to the mid-1990s. Seniors at selective liberal arts colleges exhibited the greatest capacity for life-long learning during both time periods. One cause for concern is that smaller fractions of students in the 1990s reported making progress in certain higher-order intellectual skills. The findings suggest that colleges and universities should assess whether they are providing the learning experiences that will help students acquire the skills and competencies needed for life-long learning.

The Capacity for Life-Long Learning of College Seniors in the Mid-1980s and the Mid-1990s

The links between the labor market and the individual and societal benefits of higher education are well documented (Bowen, 1978; Geske, 1996; Leslie & Brinkman, 1988). Until recently, the baccalaureate experience served as a rite of passage from ignorance to knowledge (Ogilvy, 1994), implying that college graduates were substantively prepared for their life's work. Employers today, however, are less interested in how much college graduates know and more concerned about whether they have the skills to obtain and apply new information in productive, creative ways (Education Commission of the States, 1995; Hunt, 1992; Jones, 1996; Twigg, 1995; Van Horn, 1995; Wirth, 1993). The shift in the relative importance of acquired knowledge contrasted with the ability to find and use relevant, high quality information is a direct result of the "waves of transformation" (Rowley, Lujan & Dolence, 1998, p. 91) washing over virtually every sector of the economy, flooding workplaces, schools, and homes with amounts of information unimagined just a decade ago. "Knowledge workers" already compose about a third of the work force (Drucker, 1994) reflecting the changing character of the workplace including where work is performed. In fact, 60% of all employees now work in non-traditional settings or by telecommuting, many in unsupervised, self-managed teams (Boyett & Snyder, 1998). Add to this description the prospect that perhaps as many as half of all workers in the next decade will be temporary, contract, or part-time and it is clear that the nature and structure of the activities of tomorrow's workforce will be very different from that for which college graduates have traditionally been prepared.

To flourish in the workplace of the future, people must be able to communicate

effectively, understand their organization's strategic goals and values, manage and discern patterns in massive flows of information, work well with others in a world in which economic and social problems are increasingly abstract and complex ("Toward Clearer Connections", 1998), and master perpetual learning technologies such as desk-top computers and the World Wide Web (Rowley et al., 1998). While quarrelling over the best approaches for cultivating these competencies, faculty members, employers, and policy makers agree on the broad domains of general skills and competencies that college graduates should have, such as being able to define problems, identify the information and technology needed to address the problem or issue, and have the requisite knowledge and competencies to apply what they have learning to generate and implement alternative solutions (Jones, 1997). As The Wingspread Group (1993) succinctly put it, not only must colleges and universities prepare students "to learn their way through life" (p. 2), they must also help engender "a national culture" (p. 20) that encourages both formal, long-term and informal, just-in-time learning consistent with unprecedented conditions and demands.

For these reasons, it is essential that undergraduates acquire, at a higher level than ever before, the skills for discovering, synthesizing, and applying new information, identifying and evaluating potential approaches to problem solving, and working collaboratively with people from different backgrounds. These skills, competencies, and attitudes are consistent with what has been traditionally called life-long learning, though more recently terms such as continuous learning (Drucker, 1994; O'Donnell, 1996; Ogilvy, 1994; Twigg, 1995) and perpetual learning (Norris, 1996) have been introduced to underscore their critical importance and declare that learning is not something that is done apart or away from, but is integral to, other aspects of

life, such as work, family, and civic involvement. It is not known whether colleges and universities are giving more emphasis to helping students acquire life-long learning skills and competencies or the degree to which students exhibit these attributes when they leave college.

Purpose

This study examines the extent to which students are acquiring continuous life-long learning skills. More specifically, to what extent do seniors make substantial progress during college in developing life-long learning skills? Has the capacity for life-long learning of undergraduates increased over the past decade to keep pace with escalating demands for these competencies in the external environment? And do some types of institutions and majors better prepare graduates to meet the challenges and demands of the 21st century and to live productive, self-sufficient lives after college?

Methods

Data Source and Instrument

The data source for this study is the College Student Experiences Questionnaire (CSEQ) national database which includes more than 200,000 student records from over 600 colleges and universities since 1983. The CSEQ (3rd edition) collects information about respondents' background (e.g., age, race or ethnicity, gender, major, parents' education and contribution to educational expenses) and asks students about their experiences in three areas: (a) the amount of time and energy (effort) they devoted to various activities (14 Activities Scales), (b) their perceptions of dimensions of their institution's environment known from previous research to be positively linked to learning and personal development (8 Environment scales), and what they gained from attending college (23 Estimate of Gains items). Gains scores have been shown

to be generally consistent with other evidence, such as results from achievement tests (Brandt, 1958; DeNisi & Shaw, 1977; Hansford & Hattie, 1982; Lowman & Williams, 1987; Pike, 1995; Pace, 1985). According to Ewell and Jones (1996), the CSEQ' psychometric properties' are "excellent" (p. 31) and the instrument has high to moderate potential for assessing student behavior and aspects of the college environment associated with desired outcomes.

One of the measures derived from the CSEQ is the Capacity for Life-long Learning (CLLL) index which estimates the extent to which students are acquiring continuous learning skills (Kuh, Vesper, Connolly, & Pace, 1997). This index is calculated by summing student responses to 11 gain items considered important for being self-sufficient and productive after college. The items contributing to the CLLL are: (1) thinking analytically (ANALY), (2) synthesizing information and putting ideas together (SYNTH), (3) analyzing quantitative problems (QUANT), (4) learning on one's own (INQ), (5) using computers (CMPTS), (6) writing effectively (WRITE), (7) gaining a broad, general education (GENED), (8) understanding new scientific or technological developments (TECH), (9) getting along with others (OTHERS), (10) functioning as a team member (TEAM), and (11) acquiring specialization for further education (SPEC). Taken together, these items represent a student's ability to "learn to learn" and interact effectively with others in a complex, information-based world. Students are asked to estimate the extent to which they have made progress in these areas up to now in college using a 4 point scale: 1="very little," 2="some," 3="quite a bit," and 4="very much." The index is reliable (.84) with item-score correlations ranging from .49 to .75 and item intercorrelations ranging from .13 to .59 (Kuh et al., 1997).

Sample

The sample for this study (n=26,629) is composed of seniors from 173 four-year colleges and universities who completed the CSEQ in 1984-87 (n=9,835) or in 1994-97 (n=16,794). Only seniors are included because they have the most exposure to college, benefit the most (Pascarella & Terenzini, 1991) and, therefore, are the best qualified to estimate the extent to which undergraduates acquire life-long learning skills and competencies during college. Of all respondents, about 37% were from 57 doctoral-granting universities (DUs), 41% from 61 comprehensive colleges and universities (CCUs), 7% from 16 selective liberal arts colleges (SLAs), and 15% from 40 general liberal arts colleges (GLAs).

Data Analysis

To determine if changes occurred in students' capacity for life-long learning, ANOVAs, ANCOVAs, and post-hoc multiple comparison tests (Scheffe, Bonferroni) were used to compare the CLLL index scores of seniors from the 1980s with those of seniors from the 1990s. Comparisons were also made by institutional type and major field. When differences were found, Kruskal-Wallis ANOVAs were used to examine scores between the two time periods for the individual gain items that make up the CLLL. Because socio-economic status (SES) is typically positively correlated with ability (as measured by college entrance examinations), a constant variable to represent SES was created and used as a covariate. SES was determined by summing responses to CSEQ items that measured the amount the student's family contributed to educational costs (coded 1-4, from none to all), the level of parents' education (coded 1-3, with 1=neither parent a college graduate, 2=one parent a graduate, or 3=both parents graduates), and the number of hours per week the student worked on campus (coded 1-5, from none to 30 or more).

Results

Table 1 shows the means of the CLLL index by institutional type, adjusted for SES. Students at SLAs had the highest CLLL in both the 1980s and 1990s. For the overall sample, the CLLL remained relatively stable from the mid-1980s (31.18) to the mid-1990s (31.39). However, statistically significant increases occurred at SLAs ($p<.01$), GLAs ($p<.05$), and DUs ($p<.001$).

(insert Table 1 about here)

Familiarity with computers (CMPTS) was the gain item with the largest increase in proportion of students reporting substantial progress (sum of "quite a bit" and "very much" progress) between the mid-1980s and the mid-1990s (Table 2). In fact, the 21% increase was great enough to potentially mask changes across time in the proportions of students making substantial progress in other areas. Also worthy of note is that CMPTS correlated only (.49) with the CLLL score and had the lowest item intercorrelations (ranging from .13 to .31) of all the items contributing to the CLLL, suggesting that CMPTS measures something different than the other gains scales (Kuh & Vesper, 1998).

To obtain a more accurate estimate of the degree to which college seniors were cultivating key life-long learning skills and competencies, CMPTS was removed from the CLLL and the data re-analyzed. The results are presented in Table 1 in the rows labeled, CLLLWC. With CMPTS removed, the capacity for life-long learning actually decreased slightly from the 1980s to the 1990s (28.82 to 28.57, $p<.001$). A significant decrease ($p<.01$) occurred at CCUs during this time period and only for seniors at DUs did the CLLLWC score not decline.

(insert Table 2 about here)

To understand which gains items accounted for the drop in the CLLLWC, Table 2 shows the percentages of seniors who indicated substantial progress on all 11 items for both time periods for all students and by institutional type. In addition to the dramatic increase in CMPTS, the proportions of students reporting substantial gains increased by at least 5% in writing (WRITE) and functioning as a team member (TEAM) ($p<.001$). However, at the same time, statistically significant decreases ($p<.001$) occurred on seven other gain items: SPEC, GENED, QUANT, OTHERS, TECH, SYNTH, and INQ. Understanding science and technology (TECH) remained the area with the lowest proportion of students reporting substantial progress, 37% in the 1980s and only 33% in the 1990s ($p<.001$). The directions of the shifts in percentages of seniors making substantial progress were generally comparable across institutional types, though the magnitudes of the changes varied (Table 2).

Table 3 compares the rankings of adjusted means of the CLLL without CMPTS (CLLLWC) by major field from the mid-1980s to the mid-1990s. As with the pooled sample, the CLLL scores by major over time were relatively stable. Even though four of the six top-ranked majors (biological sciences, computer science, health-related fields, humanities, physical sciences, social sciences) showed statistically significant decreases and five majors (agriculture, arts, business, education, engineering) increased, the changes were usually only about one scale point and probably do not represent shifts of any practical significance. However, it is worth noting that two majors popular in the late 1980s and early 1990s, computer science and business, fared poorly in this analysis, ranking 9th and 10th respectively out of 11. As a group, seniors majoring in the basic academic disciplines (defined as biological sciences, humanities,

physical sciences, and social sciences) had higher CLLLWC scores. However, the CLLLWC score for the basic discipline group dropped during the past decade, narrowing the gap between basic and applied fields (arts, agriculture, business, computer science, education, engineering, health-related fields).

(insert Table 3 about here)

Limitations

This study is limited in several ways. Although the study includes more than 26,500 students at dozens of institutions from every region of the country, sampling bias may affect the findings in unknown ways as different institutions are represented in the two time periods. Student characteristics in addition to SES (which was held constant) such as motivation surely influence what students gain from attending college. Finally, the CLLL index may not accurately estimate the continuous life-long learning skills and competencies that it purports to assess. Even though the gains items selected for the CLLL index are widely acknowledged to be integral to life-long learning and the psychometric properties (e.g., individual gain item correlations, item intercorrelations) of the index are well within acceptable ranges, additional research is needed to determine the predictive validity of the CLLL and post-college performance.

Conclusions and Implications

The findings from this study point to three conclusions about the acquisition of continuous life-long learning skills during college.

First, the capacity of life-long learning of seniors in the 1990s approximated that of their counterparts from the 1980s. Indeed, in some key areas (writing, team-work, computers),

performance improved over time. However, removing familiarity with computers from the equation produced a drop over time in the overall index which was a function of decreases in several individual gains items. Of particular concern are declines in the proportions of seniors reporting substantial progress on items representing higher order intellectual functioning, such as learning on one's own (INQ) and the ability to synthesize information and put ideas together (SYNTH). These findings are worrisome because the demand for life-long learning skills and competencies has intensified. Therefore, it may not be sufficient in the future for seniors to cultivate the same level of continuous learning skills and competencies as in previous decades.

Second, larger proportions of students at SLAs made substantial progress on gains items associated with life-long learning compared with their counterparts at other types of colleges and universities, especially GLAs and CCUs. Surely student selectivity is a factor, even though SES in this study was controlled which is highly correlated with ability. At the same time, it is difficult to assess and control for student motivation and clarity of focus which may advantage SLAs in that they probably attract larger proportions of more highly motivated students than other types of institutions.

Third, students majoring in basic academic disciplines appeared to fare better than others in developing life-long learning skills and competencies. This is not surprising, perhaps, given the emphasis many of these fields place on skills such as analysis, synthesis, and quantitative reasoning. At the same time, business and computer science majors reported some of the smallest life-long learning gains. These two academic areas were very popular among students at points during the past decade, largely because of the numerous employment opportunities they provide. They also represent areas of the economy that rely on knowledge of

complex information systems and are among the most dynamic, rapidly changing sectors of the work world where productivity depends on workers' ability to reason quantitatively, solve problems, put ideas together, and communicate clearly (Education Commission of the States, 1995). Such dynamic environments will place additional pressure on institutions of higher education and students with professional majors, such as business and computer science, to further hone their life-long learning skills for competitive advantages in the workplace (Dolence & Norris, 1995; Jones, 1996).

Implications

The sweeping demographic, economic, and technological changes underway highlight what may be a potential mismatch between what people need from higher education and what they get. In earlier decades, obtaining an entry-level job coming out of college was considered evidence that higher education was effectively preparing the next generation of productive workers. The results from this study can be interpreted as either a glass half-full or half-empty, thus providing ammunition for both boosters and critics of American higher education. On the one hand, it could be argued that our universal access higher education system is doing a reasonably good job, as the CLLL index was stable over the past decade and three-quarters or more students reported making substantial progress on most CLLL items. During this time, undergraduate enrollments expanded by a third and a larger fraction of high school graduates matriculated, many of them exhibiting a preference for the "concrete" learning style that is not well-suited for abstract reasoning (Schroeder, 1993). Even so, the magnitude of the drops at GLAs and CCUs and in certain areas is a concern, especially the decreases in the proportions of students making substantial progress on SYNTH and INQ. These latter drops are worrisome,

both for their magnitude but also for their relative importance to managing and making meaning of large amounts of information from disparate sources, a key to economic productivity and self-sufficiency in an increasingly complex, information-based society.

At first blush, the dramatic increase in the proportion of students learning about computers is welcome. At the same time, few studies have examined the relationships between technology and student learning to determine the nature of the contributions computers make to desired educational outcomes (Deden & Jones, 1996). Surely some practical skills are associated with using computers (e.g., word processing, familiarity with the World Wide Web). But too much time spent on these activities could be at the expense of cultivating more complex, higher order cognitive skills. For this reason, additional research is needed to determine what the familiarity of computers item is actually measuring and how and to what degree technology, information systems, and computers are related to desired outcomes and the approaches to using technology that are most effective in producing these gains (Boyett & Snyder, 1998).

The findings point to a critical challenge: what can an institution do to increase the proportion of its students who develop analytic, synthesis, and self-directed learning skills and competencies? Faculty generally agree that all college graduate should have these skills as well as be able to communicate effectively, identify and solve problems, reason quantitatively, and adapt to innovation and change. What can colleges and universities do to ensure that more students become competent in these areas? It is much more difficult to cultivate life-long learning skills than teach content. Synthesis skills, for example, may result from opportunities to apply information and knowledge and courses should be designed with these goals and

activities in mind. This suggests that faculty development efforts and instructional support services should focus on approaches that are empirically linked with or proven to cultivate these skills, both in major and in high-enrollment general education courses, as well as outside the classroom where students spend the majority of their time and where opportunities to apply what they are learning in class are in ample supply (Kuh, Schuh, Whitt & Associates, 1991).

Making systemic changes in the curriculum and other areas that will address these life-long learning skills will require enormous institutional effort including financial resources for faculty and staff development and a restructured faculty reward system that encourages high levels of engagement between faculty and students in the learning process, broadly defined (Brand, 1993; Diamond, 1997). In addition, research is needed to determine if learning communities and other interventions that actively engage more students more of the time in educationally-purposeful activities promote acquisition of various life-long learning skills and competencies. Discovering the specific college activities (efforts) and environmental factors that are associated with gains in life-long learning

can help close the gap that distinguishes the quality of the educational experience at selective liberal arts colleges from other types of institutions.

The most and, perhaps, best that colleges and universities can do for their students is provide opportunities to acquire the skills and competencies that they will need and use every day the rest of their life, at work or at leisure. Toward this end, institutions must persuasively communicate to students and their families the value of and need to develop continuous learning skills as a counterpoint to the commonly held but erroneous view that a baccalaureate degree is sufficient preparation for a job. Institutions need to constantly remind students and

others that skill development does not end upon graduation and that learning occurs over an entire lifetime (Education Commission of the States, 1996).

References

Bowen, H.R. (1978). Investment in learning. San Francisco: Jossey-Bass.

Boyett, J.H., & Snyder, D.P. (1998). Twenty-first century workplace trends. On The Horizon, 6(1), 1, 4-9.

Brand, M. (1993, Fall). The challenge to change: Reforming higher education. Educational Record, 7-13.

Brandt, R. M. (1958). The accuracy of self estimates. Genetic Psychology Monographs, 58, 55-99.

Deden, A. & Carter, V.K. (1996). Using technology to enhance students? skills. In E. Jones (Ed.), Preparing competent college graduates: Setting new and higher expectations for student learning. New Directions for Higher Education, No. 96 (pp. 81-92). San Francisco: Jossey-Bass.

DeNisi, A.S., & Shaw, J.B. (1977). Investigation of the uses of self-reports of abilities. Journal of Applied Psychology, 62, 641-644.

Dolence, M.G., & Norris, D.M. (1995). Transforming higher education: A vision for learning in the 21st century. Ann Arbor, MI: Society for College and University Planning.

Drucker, P. (1994, November). The age of social transformation. Atlantic Monthly, 247(5), 53-80.

Education Commission of the States (1995). Making quality count in undergraduate education. Denver, CO: Education Commission of the States.

Education Commission of the States (1996). Connecting learning and work: A call to action. Denver, CO: Education Commission of the States.

Ewell, P.T., & Jones, D.P. (1996). Indicators of "good practice" in undergraduate education: A handbook for development and implementation. Boulder, CO: National Center for Higher Education Management Systems.

Geske, T.G. (1996). The value of investments in higher education: Capturing the full returns. In D.S. Honeyman, J.L. Wattenbarger, & K.C. Westbrook (Eds.), A struggle to survive: Funding higher education in the next century (pp. 29-48). Thousand Oaks, CA: Corwin.

Hansford, B.C., & Hattie, J.A. (1982). The relationship between self and achievement/performance measures. Review of Educational Research, 52, 123-142.

Jones, E.A. (Ed.) (1996). Preparing competent college graduates: Setting new and higher expectations for student learning. New Directions for Higher Education, no. 96. San Francisco: Jossey-Bass.

Jones, E.A. (1997). Problem-solving and critical reading outcomes expected by faculty, employers, and policy makers. Assessment update, 9 (5), 8-10.

Kuh, G.D., Schuh, J.S., Whitt, E.J. & Associates. (1991). Involving colleges: Successful approaches to fostering student learning and personal development outside the classroom. San Francisco: Jossey-Bass.

Kuh, G.D., & Vesper, N. (1998, August). Do computers enhance or detract from student learning? Bloomington, IN: Indiana University Center for Postsecondary Research and Planning.

Kuh, G.D., Vesper, N., Connolly, M.R., & Pace, C.R. (1997). College Student Experiences Questionnaire: Revised norms for the third edition. Bloomington, IN: Indiana University Center for Postsecondary Research and Planning.

Leslie, L.L., & Brinkman, P.T. (1988). The economic of higher education. New York: ACE/ MacMillan.

Lowman, R.L., & Williams, R.E. (1987). Validity of self-ratings of abilities and competencies. Journal of Vocational Behavior, 31, 1-13.

Norris, D.M. (1996). Perpetual learning as a revolutionary creation. On The Horizon, 4(6), 1, 3-6.

O'Donnell, J.J. (1996, Winter). The digital challenge. Wilson Quarterly, 48-49.

Ogilvy, J. (1994). The information revolution. On The Horizon, 2(4), 1-2, 4.

Pace, C.R. (1985). The credibility of student self-reports. Los Angeles: University of California, The Center for the Study of Evaluation, Graduate School of Education.

Pace, C.R. (1990). The undergraduates: A report of their activities and college experiences in the 1980s. Los Angeles: Center for the Study of Evaluation, UCLA Graduate School of Education.

Pascarella, E.T., & Terenzini, P.T. (1991). How college affects students: Findings and

insights from twenty years of research. San Francisco; Jossey-Bass.

Pike, G.R. (1995). The relationships between self reports of college experiences and achievement test scores. Research in Higher Education, 36, 1-22.

Rowley, D.J., Lujan, H.D., & Dolence, M.G. (1998). Strategic choices for the academy: How demand for lifelong learning will re-create higher education. San Francisco: Jossey-Bass.

Schroeder, C.C. (1993, September/October). New students: New learning styles. Change, 25(4), 21-26.

Smith, D.G. (1990). Embracing diversity as a central campus goal. Academe, 76 (6), 29-33.

"Toward clearer Connections: Understanding employers' perceptions of college graduates" (1998, May/June). Change, 30(3), 47-50.

Twigg, C.A. (1995). The need for a national learning infrastructure. Washington, DC: Educom.

Wingspread Group on Higher Education (1993). An American imperative: Higher expectations for higher education. Racine, WI: Johnson Foundation.

Wirth, A.G. (1993). Education and work: The choice we face. Phi Delta Kappan, 74(5), 361-366.

Table 1
Comparison of Adjusted Means for Capacity for Life-Long Learning Index With (CLLL) and Without Computer Gains (CLLLWC) By Institutional Type

		DU *Adj. Mean* *(n=9,775)*	*DU* *S.D.*	*CCU* *Adj. Mean* *(n=10,925)*	*CCU* *S.D.*	*SLA* *Adj. Mean* *(n=1,907)*	*SLA* *S.D.*	*GLA* *Adj. Mean* *(n=4,022)*	*GLA* *S.D.*	*Group* *Total* *(n=26,629)*	*Group* *S.D.*
Mid-1980s	*CLLL*	30.91	5.32	31.06	5.41	32.71	4.99	30.98	5.66	31.18	5.39
(n=9,835)	*CLLLWC*	28.54	4.91	28.75	5.04	30.08	4.59	28.84	5.30	28.82	4.99
Mid-1990s	*CLLL*	31.42***	5.61	31.22	5.79	33.14**	5.06	31.35*	5.66	31.39**	5.69
(n=16,794)	*CLLLWC*	28.55	5.14	28.43**	5.35	30.04	4.65	28.58	5.23	28.57***	5.25

* p < .05 ** p < .01 *** p < .001

CLLL = Capacity for Life-Long Learning Index

CLLLWC = Capacity for Life-long Learning Without Computer Gains

Adj. Mean = Mean adjusted for student socio-economic status

Table 2
Percentages of Seniors Indicating Substantial Progress
During Their College Experience
All Students Combined and By Institutional Type

		SPEC	GENED	WRITE	OTHER	TECH	ANALY	SYNTH	QUANT	INQ	CMPTS	TEAM
Combined (n=26,629)	***1980s*** Substantial	73%	72%	63%	79%	37%	73%	79%	54%	86%	42%	65%
	1990s Substantial	71%	69%	68%	76%	33%	72%	75%	50%	81%	63%	70%
	X^2	11.14***	24.64***	64.87***	46.19***	43.60***	3.93	47.22***	39.97***	114.07***	1079.58***	80.91***
DUs (n=9,775)	***1980s*** Substantial	73%	67%	57%	77%	38%	72%	77%	55%	85%	43%	63%
	1990s Substantial	71%	67%	63%	76%	37%	74%	76%	51%	82%	64%	67%
	X^2	2.52	.01	37.59***	1.66	1.29	3.38	.16	12.87***	23.36***	456.23***	22.09***
CCUs (n=10,925)	***1980s*** Substantial	70%	70%	61%	79%	40%	72%	78%	56%	86%	40%	70%
	1990s Substantial	70%	67%	69%	75%	32%	71%	74%	50%	81%	62%	73%
	X^2	.05	7.13*	57.85***	14.30***	75.97***	1.48	16.31***	29.43***	40.53***	416.25***	7.50*
SLAs (n=1,907)	***1980s*** Substantial	77%	88%	81%	85%	32%	81%	88%	51%	91%	54%	58%
	1990s Substantial	79%	81%	79%	79%	35%	84%	86%	50%	91%	76%	64%
	X^2	.95	14.94***	.92	7.88**	1.24	1.96	1.96	.27	.00	85.69***	6.40*
GLAs (n=4,022)	***1980s*** Substantial	75%	74%	67%	83%	32%	72%	80%	52%	88%	35%	71%
	1990s Substantial	71%	74%	69%	76%	30%	71%	75%	49%	82%	61%	72%
	X^2	6.97*	.02	2.21	28.06***	1.19	1.14	13.15***	3.26	21.40***	238.79***	.24

* $p < .01$ ** $p < .005$ *** $p < .001$

Table 3
Ranking of Adjusted Means for Capacity for Life-Long Learning Index Without Computer Gains (CLLLWC) By Major Type

Major Field of Study	*Mid-1980s Adj. Mean (n=8,232)*	*Mid-1980s Rank*	*Mid-1990s Adj. Mean (n=14,057)*	*Mid-1990s Rank*	*Group Total (n=22,289)*	*Group Rank*
Agriculture	28.03	8	29.71**	4	28.54	6
Arts	27.08	11	27.15	11	27.13	11
Biological Sciences	30.87	1	30.41	1	30.55	1
Business	27.73	9	27.82	10	27.78	10
Computer Science	28.97	6	27.91**	9	28.46	7
Education	27.67	10	28.20*	7	28.08	9
Engineering	29.96	3	30.01	3	29.98	3
Health Related Fields	29.93	4	29.54	5	29.68	4
Humanities	28.62	7	28.19	8	28.36	8
Physical Sciences	30.75	2	30.26	2	30.48	2
Social Sciences	29.02	5	28.46***	6	28.67	5
Group Total	28.80		28.54		28.64	

* p < .05 ** p < .01 *** p < .001

CLLLWC = Capacity for Life-Long Learning Without Computer Gains

Adj. Mean = Mean adjusted for student socio-economic status